33. Write the dimensions of $a \times b$ in the relation $E = \dfrac{b - x^2}{at}$, where E is the energy, x is the displacement, and t is the time.

(1) ML^2T (2) $M^{-1}L^2T^1$
(3) ML^2T^{-2} (4) MLT^{-2}

34. If the velocity of light C, the universal gravitational constant G, and Planck's constant h are chosen as fundamental units, the dimensions of mass in this system are

(1) $h^{1/2}C^{1/2}G^{-1/2}$ (2) $h^{-1}C^{-1}G$
(3) hCG^{-1} (4) hCG

35. The effective length of a simple pendulum is the sum of the following three: length of string, radius of bob, and length of hook.
In a simple pendulum experiment, the length of the string, as measured by a meter scale, is 92.0 cm. The radius of the bob combined with the length of the hook, as measured by a vernier callipers, is 2.15 cm. The effective length of the pendulum is

(1) 94.1 cm (2) 94.2 cm
(3) 94.15 cm (4) 94 cm

36. The moment of inertia of a body rotating about a given axis is 12.0 kg m^2 in the SI system. What is the value of the moment of inertia in a system of units in which the unit of length is 5 cm and the unit of mass is 10 g?

(1) 2.4×10^3 (2) 6.0×10^3
(3) 5.4×10^5 (4) 4.8×10^5

37. If the velocity (V), acceleration (A), and force (F) are taken as fundamental quantities instead of mass (M), length (L), and time (T), the dimensions of Young's modulus (Y) would be

(1) FA^2V^{-4} (2) FA^2V^{-5}
(3) FA^2V^{-3} (4) FA^2V^{-2}

38. The percentage errors in the measurement of mass and speed are 2% and 3%, respectively. How much will be the maximum error in the estimation of KE obtained by measuring mass and speed?

(1) 5% (2) 1%
(3) 8% (4) 11%

39. An experiment measures quantities a, b, and c, and then X is calculated from $X = \dfrac{a^{1/2}b^2}{c^3}$. If the percentage errors in a, b, and c are $\pm 1\%$, $\pm 3\%$, and $\pm 2\%$, respectively, then the percentage error in X can be

(1) $\pm 12.5\%$ (2) $\pm 7\%$
(3) $\pm 1\%$ (4) $\pm 4\%$

40. The resistance of a metal is given by $R = V/I$, where V is potential difference and I is the current. In a circuit, the potential difference across resistance is $V = (8 \pm 0.5)$ V and current in resistance, $I = (4 \pm 0.2)$ A. What is the value of resistance with its percentage error?

(1) $(2 \pm 5.6\%)\ \Omega$ (2) $(2 \pm 0.7\%)\ \Omega$
(3) $(2 \pm 35\%)\ \Omega$ (4) $(2 \pm 11.25\%)\ \Omega$

41. The mass of the liquid flowing per second per unit area of cross section of the tube is proportional to P^x and v^y, where P is the pressure difference and v is the velocity, then the relation between x and y is

(1) $x = y$ (2) $x = -y$
(3) $y^2 = x$ (4) $y = -x^2$

42. A physical quantity x is calculated from $x = ab^2/\sqrt{c}$. Calculate the percentage error in measuring x when the percentage errors in measuring a, b, and c are 4, 2, and 3%, respectively.

(1) 7% (2) 9%
(3) 11% (4) 9.5%

43. The specific resistance ρ of a circular wire of radius r, resistance R, and length l is given by $\rho = \pi r^2 R/l$. Given: $r = 0.24 \pm 0.02$ cm, $R = 30 \pm 1\ \Omega$, and $l = 4.80 \pm 0.01$ cm. The percentage error in ρ is nearly

(1) 7% (2) 9%
(3) 13% (4) 20%

44. Using mass (M), length (L), time (T), and electric current (A) as fundamental quantities, the dimensions of permittivity will be

(1) $[MLT^{-1}A^{-1}]$ (2) $[MLT^{-2}A^{-2}]$
(3) $[M^{-1}L^{-3}T^4A^2]$ (4) $[M^2L^{-2}T^{-2}A]$

45. Assuming that the mass m of the largest stone that can be moved by a flowing river depends upon the velocity v of the water, its density ρ, and the acceleration due to gravity g. Then m is directly proportional to

(1) v^3 (2) v^4
(3) v^5 (4) v^6

46. A spherical body of mass m and radius r is allowed to fall in a medium of viscosity η. The time in which the velocity of the body increases from zero to 0.63 times the terminal velocity (v) is called time constant (τ). Dimensionally, τ can be represented by

(1) $\dfrac{mr^2}{6\pi\eta}$ (2) $\sqrt{\dfrac{6\pi mr\eta}{g^2}}$
(3) $\dfrac{m}{6\pi\eta rv}$ (4) None of these

47. A liquid drop of density ρ, radius r, and surface tension σ oscillates with time period T. Which of the following expressions for T^2 is correct?

(1) $\dfrac{\rho r^3}{\sigma}$ (2) $\dfrac{\rho\sigma}{r^3}$
(3) $\dfrac{r^3\sigma}{\rho}$ (4) None of these

48. A highly rigid cubical block A of small mass M and side L is fixed rigidly on the other cubical block of same dimensions and of modulus of rigidity η such that the lower face of A completely covers the upper face of B. The lower face of B is rigidly held on a horizontal surface. A small force F is applied perpendicular to one of the side faces of A. After the force is withdrawn, block A executes small oscillations, the time period of which is given by

(1) $2\pi\sqrt{M\eta L}$ (2) $2\pi\sqrt{M\eta/L}$
(3) $2\pi\sqrt{ML/\eta}$ (4) $2\pi\sqrt{M/\eta L}$